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Creating financial value for tropical forests by disentangling people from nature

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Abstract

Efforts to address environmental problems have led to a rapid proliferation of mechanisms for creating financial value for nature. This paper argues that the creation of financial value for nature requires work to disentangle and frame the relation between people and nature so as to render this relation calculable, and that this work acts to alienate people from nature. To pursue and progress this argument, the paper analyses the work of the United Nations Framework Convention on Climate Change (UNFCCC) to establish a mechanism to create financial value for tropical forests based on their capacity to store carbon. The analysis finds that the UNFCCC's work of disentanglement and framing, so as to render calculable the relation between people and forests, has created conditions that threaten to materially degrade the ecological value of tropical forest biodiversity and the cultural/spiritual value of forests to indigenous peoples. The findings support this paper's argument that the alienation of people from nature is not simply a consequence of financial valuation, but rather is a necessary prerequisite for creating financial value for nature.

1. Introduction

It is now widely espoused by policy-makers that environmental problems, like climate change and global biodiversity loss, result from market failures, whereby the value of services provided by nature are not fully taken into account in economic decision-making (IUCN, 2017; World Bank, 2016). A United Nations report on the economics of ecosystems and biodiversity argues that 'the economic invisibility of nature's flows into the economy is a significant contributor to the degradation of ecosystems and the loss of biodiversity' (TEEB, 2010, p. xxvi). This logic has led policy-makers towards efforts to bring the value of nature into economic decision-making (Deegan, 2013, 2017). One approach to this has been to encourage businesses and other organisations to account for their so-called "natural capital". This essentially involves establishing notional economic values for nature so that organisations can become more aware of the importance of nature for sustaining their own operations (ACCA, Flora and Fauna International, & KPMG, 2012; Natural Capital Coalition,

2016). A more radical approach, however, has been the rapid proliferation of mechanisms that enable the generation of actual financial revenues from nature conservation activities (UN, 2018a). Such mechanisms have the effect of turning nature into a financially valuable asset, thus incentivising its protection. The creation of financial value for nature, in this way, essentially changes the economic “rules of the game” of capitalism so as to address the market failures that are seen as being the root cause of environmental problems (Cuckston, 2013; MacKenzie, 2009a). The purpose of this paper is to show that creating conditions conducive to calculating financial value for nature requires work to disentangle people from nature.

Within the accounting literature, scholars have repeatedly argued that valuing nature in financial terms will ultimately be detrimental to its protection. Hines (1991) argues that seeing nature through economic eyes will not lead to environmental stewardship but, rather, will lead people to use economic arguments to justify the destruction of nature. Hines suggests that the real value of nature to people cannot be measured in financial terms, and that viewing nature in this way will ‘alienate people from nature’ (p. 29).

This fundamental critique of efforts to create financial value for nature has recurred in the literature in the context of numerous mechanisms. Criticising the emergence of sulphur dioxide emissions trading as a solution to the problem of acid rain, Lehman (1996) argues that trying to use the market to control the relationship between people and nature leads to a ‘potentially disastrous environmental ethic’ (p. 671). Similar arguments dominate critique of carbon emissions trading markets, with McNicholas and Windsor (2011) warning that carbon accounting ‘atomises nature’ (p. 1087) so as to make it amenable to economic calculation. Likewise, Andrew, Kaidonis, and Andrew (2010) argue that by framing the problem as a failure of markets, which can be solved by constructing new markets, carbon emissions trading cannot produce the shift in societal mindset required to address the unprecedented challenge of global climate change:

[A]ny approach that simply encourages the market to put a price on the environment is inadequate as a response to environmental problems since this does not sufficiently orient business or society in general towards the environmental issues that we face (p. 616).

Furthermore, the proliferation of mechanisms for creating financial value for nature, with the rise of various forms of biodiversity offsetting, has led to accusations that financial accounting techniques are being used in ways that hide and/or justify the destruction of nature (Boiral, 2016; Ferreira, 2017; Sullivan & Hannis, 2017; Tregidga, 2013). This widespread movement towards accounting for nature in terms of financially valuable “natural

capital”, is seen to be leading society towards a collective mindset wherein nature is only worth protecting *because* of its financial value (Barter, 2015; Hrasky & Jones, 2016). Lehman (2017) argues that this form of accounting for nature, in terms of financial values, ‘perpetuate[s] an instrumental approach to the world ... thereby hindering the development of ethical and moral standards’ (pp. 32-33).

Thus there is a basic critique within the extant literature that mechanisms that seek to address environmental problems by creating financial value for nature have the effect of encouraging an instrumental mindset towards nature, which undermines people’s sense of connection to, and responsibility for the protection of, nature. That is, such mechanisms perpetuate an economic worldview in which people become detached and alienated from nature. But is this the whole story of the causal relationship between creation of financial value for nature and people’s separation from nature? The extant literature appears to view the act of creating financial value for nature as a largely abstract exercise, such that the effects of financial valuation come *after* a financial value has been assigned to nature. That is, the alienation of people from nature is seen to be due simply to the way that financial values represent nature in economic terms. In contrast, this paper will argue that the act of creating financial value for nature involves work to materially¹ separate people from nature. That is, the alienation of people from nature is not simply a consequence of financial valuation, but rather is a necessary *prerequisite* for the creation of financial value for nature.

In order to be able to examine how creation of financial value for nature gives rise to the alienation of people from nature, this paper will study a case of the creation of financial value for nature to address an environmental problem: that of tropical deforestation. Drawing on theoretical developments in the social studies of finance (Callon, 1998b; MacKenzie, 2009b; Vollmer, Mennicken, & Preda, 2009), this paper will analyse a mechanism designed to address the problem of tropical deforestation by creating a financial value for forests based on their capacity to store carbon. The mechanism is part of the Paris Climate Change Agreement reached by the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015. The mechanism is called *Reducing Emissions from Deforestation and forest Degradation* (REDD) and is described by the United Nations as follows:

REDD is a mechanism to create an incentive for developing countries to protect, better manage and wisely use their forest resources, contributing to the global fight

¹ The term material here, and throughout this paper, is used to denote that relations between actors and objects will always comprise some concrete, physical interaction between them (cf. MacKenzie, 2009b).

against climate change. REDD strategies aim to make forests more valuable standing than they would be cut down, by **creating a financial value** for the carbon stored in trees. Once this carbon is assessed and quantified, the final phase of REDD involves developed countries paying developing countries carbon offsets for their standing forests (UN, 2010a, p. 1, emphasis added).

The aim of analysing this mechanism is to explain how such financial value for tropical forests is created. That is, what work is done to create conditions in which calculating financial value for tropical forests is made possible? The analysis will demonstrate that this work involves a systematic disentanglement – i.e. detachment and separation (Callon, 1998a) – of people from tropical forests. That is, to create conditions in which the calculation of financial value for tropical forests becomes possible, the REDD mechanism will be seen to act to materially initiate and entrench the alienation of people from nature.

The remainder of this paper is organised as follows: the next section will explain the social studies of finance theoretical framework that will inform the analysis; section 3 will briefly set out the methods of data collection and analysis used; section 4 will present the analysis of how REDD creates conditions in which the calculation of financial value for tropical forests is made possible; section 5 will conclude the paper.

2. Disentanglement and framing

This paper seeks to understand how the UNFCCC's REDD mechanism is able to create financial value for tropical forests. The extant accounting literature on the financial valuation of nature tends to focus on a key distinction between two conceptualisations of the valuation of nature: instrumental value and intrinsic value (van Liempd & Busch, 2013). On the one hand, instrumental value is understood to be the value of nature to people. That is, nature provides so-called "ecosystem services", upon which society depends, and these services can be valued in financial terms using a range of economic methods (see TEEB, 2010). On the other hand, intrinsic value is understood to be the value of nature in and of itself, independently of any usefulness of nature to people (Birkin, 1996; Christian, 2014). As such, intrinsic value cannot be measured in financial terms. The critique of financial valuation of nature may thus be expressed as challenging the failure of financial valuation to recognise that nature has intrinsic value. That is, valuing nature in financial terms creates an impression that nature's value is purely instrumental and that, as a result, people will lose touch with the idea that nature has value beyond merely the economic services it provides (Barter, 2015; Hines, 1991; Lehman, 1996, 2017).

But this critique of the financial valuation of nature belies a view of the act of calculating a financial value itself as being basically benign. The financial valuation of nature is seen to be a mere application of economic methods so as to assign a number – a financial value – to nature. It is understood, by this extant critique, to be the *effects* of this number that are dangerous, in that having the number has the effect of suppressing people's recognition of nature's intrinsic value, thus alienating people from that intrinsic value (Maunder & Burritt, 1991). However, work in the social studies of finance (SSF) literature has sought to challenge the notion that calculation of financial value is a benign act (MacKenzie, 2009b; Vollmer et al., 2009). Rather, rendering something financially valuable (i.e. capable of being valued financially) is seen to require considerable investments and work so as to create material conditions in which the calculation of financial value becomes possible (Kornberger, Justesen, Madsen, & Mouritsen, 2015). The question for SSF researchers thus becomes: how are such conditions of possibility for this calculation of financial value created?

In his seminal volume, *The Laws of the Markets*, Michel Callon (1998a, 1998b) argues that such conditions are created by constructing a socio-technical arrangement of people and devices that collectively frames a space of calculability. Devices are understood to be 'objects with agency ... [i.e.] they act or they make others act' (Muniesa, Millo, & Callon, 2007). Within a calculable space, an agent is able to see and comprehend a clearly defined relation between themselves and the entity that is the object of calculation. That is, the agent is able to identify and measure, in unambiguous concrete terms, the ways that they and the entity interact with each other: the relation between them is thus rendered calculable. To frame such a space of calculability requires work to construct a socio-technical arrangement that is able to disentangle relevant entities from the complexities of their origins. That is, the work of framing is to identify those relations that will be brought into the space of calculability and those that will remain outside of it.

In short, a clear and precise boundary must be drawn between the relations which the agents will take into account and which will serve in their calculations and those which will be thrown out of the calculation (Callon, 1998a, p. 16).

There will thus be numerous aspects of an agent's interaction with an entity that are discarded in the framing of a space of calculability. These complex entanglements will be reduced to a straightforward comprehensible – i.e. calculable – relation. In this way, the construction of a socio-technical arrangement, which comprises a metrological system for identifying and measuring the effects of interactions, is a prerequisite for financial valuation.

Money comes in last in a process of quantification and production of figures, measurements and correlations of all kinds. It is the final piece, the keystone in a

metrological system that is already in place and of which it merely guarantees the unity and coherence (Callon, 1998a, p. 22).

To explain how the conditions of possibility for calculating financial values are created, therefore, the SSF researcher seeks to identify 'all the work that has to be done, all the investments that have to be made in order to make relations calculable' (Callon, 1999, p. 187). For an object to be made financially valuable (i.e. capable of being valued in financial terms), a valuer must first do this work of cutting its entangled ties with myriad other things, such that the valued object becomes 'decontextualised, dissociated and detached' (Callon, 1999, p. 189). This disentanglement of an object of valuation from its origins is necessary to create the conditions of possibility for calculation of a financial value.

However, any framing also creates the conditions for relations that have been discarded in this process of disentanglement to *overflow* the constructed frame. Thus frames are never perfect or complete: there will always be relations between things inside the frame and things that are left outside the frame. Framings can always be challenged on the basis of these overflows: of effects that are not taken into account in the calculations made possible by the frame. Thus framing requires ongoing work to capture and contain overflows as they are identified and used as the basis to challenge the calculability that has been achieved. Framing inexorably leads to overflowing, which leads to reframing, and so on, such that framing and overflowing is a perpetual dynamic (cf. Cuckston, 2018; Skaerbaek & Tryggestad, 2010).

This SSF view of the work of creating the conditions of possibility for calculating financial value thus leads to a reconsideration of why mechanisms for creating financial value for nature will inexorably give rise to the alienation of people from nature. Rather than it being the case simply that placing a financial value upon nature will lead people to adopt an instrumental mindset that sees nature in financial terms at the expense of a deeper appreciation of their interconnectedness with nature (cf. Barter, 2015; Hines, 1991; Lehman, 1996, 2017), the SSF view points to this alienation of people from nature as being a consequence of the work of disentanglement and framing that makes calculation of financial values possible. That is, to achieve calculability, nature must be decontextualised, dissociated and detached: i.e. people and nature must be disentangled – and consequently alienated – as a necessary prerequisite for creating a financial value for nature. To understand how mechanisms are able to create financial value for nature, we must seek to explain this work of disentanglement and framing that creates conditions of possibility for calculating such financial value.

Adopting this SSF understanding of the work required to create the conditions of possibility for calculating financial value for nature, this paper's research question concerning how the UNFCCC's REDD mechanism is able to create a financial value for tropical forests becomes: how has the UNFCCC sought to construct a socio-technical arrangement that frames a space of calculability in which the calculation of financial value for tropical forests has been made possible? The methods of data collection and analysis used to try to answer this question will now be set out in the next section.

3. Data collection and analysis

The idea of bringing greenhouse gas emissions from tropical deforestation into the UNFCCC climate change regime was first mooted by a group of countries calling itself the Coalition of Rainforest Nations². Since its introduction into the UNFCCC negotiations in 2005, there has been intense debate on numerous aspects of how a REDD mechanism should be constructed. This debate has been extensively documented within the online archives of the UNFCCC (UN, 2018b). This makes these archives a valuable source of rich data for informing an analysis of the work undertaken by the UNFCCC to design and build the REDD mechanism. Data collection was undertaken in two stages. In the first stage, the aim was to collect documents that could inform an analysis of how the UNFCCC has sought to frame a space of calculability for REDD. The most important documents for this were the texts of 15 UNFCCC decisions on REDD (46 pages of text) that were agreed between 2005 and REDD's inclusion in the Paris Climate Change Agreement in 2015. To supplement these documents with contextual data about how these decisions were formulated, the reports of 6 UNFCCC workshops on REDD (132 pages of text) were also collected. In the second stage of data collection, the aim was to collect documents that could inform an analysis of how the UNFCCC's framing has been challenged. For this purpose, documents were collected comprising 177 written submissions to the UNFCCC from 69 non-governmental organisations (1697 pages of text) on the subject of REDD. These documents, written and submitted throughout the period 2005-2015, represent contemporaneous challenges to the UNFCCC's REDD framing, thus providing insights into issues raised by numerous different stakeholders to the emerging REDD mechanism. Consequently, the documents collected from the UNFCCC archive amount to a rich qualitative dataset concerning the

² The countries named as being supporters of the UNFCCC submission were Bolivia, Central African Republic, Chile, Congo, Costa Rica, Democratic Republic of the Congo, Dominican Republic, Nicaragua, and Papua New Guinea (UN, 2005b).

framing/overflowing dynamic that has characterised the design and construction of the REDD mechanism.

The overall analytical aim was to explain how the UNFCCC has sought to frame a space of calculability in which the calculation of financial value for tropical forests becomes possible. Given this aim, the documents collected from the UNFCCC archive were analysed using an interpretive approach, which is an approach whereby the analyst seeks to construct an in-depth explanation of emergent social reality (Chua, 1986; Lukka and Modell, 2017)³. As such, the analysis of the documents was conducted through a close reading (cf. Bebbington, 2008; Craig and Brennan, 2012; Cuckston, 2017) of the documents to identify important elements of framing/overflowing that have characterised the work of achieving calculability within the REDD mechanism. Craig and Brennan (2012, p. 174) argue that close readings of documentation are ‘very labor-intensive, [but] they have strong capacity to provide richer insights to apparent meaning ... than computer-assisted content analysis based solely on word-counts’. By developing a valid and credible explanation of how REDD has created conditions conducive to calculating financial value for tropical forests, this analysis will reveal theoretical insights concerning how the creation of financial value for nature requires work to disentangle – and thus alienate – people from nature.

In order to support the close reading, the documents were manually coded in three stages. NVivo qualitative analysis software was used to organise the dataset and facilitate the manual coding. In the first stage of coding, the UNFCCC decisions on REDD and the UNFCCC workshop reports were analysed to trace how the UNFCCC has sought to frame the relation between people and forests, so as to render this relation calculable. To do this, descriptive coding was used to identify calculative devices that were brought into the socio-technical arrangement comprising the REDD mechanism. Where such devices were identified, further descriptive coding was used to identify their impact on the calculability achieved by the REDD mechanism. In the second stage of coding, the written submissions from non-governmental organisations were analysed to trace how these organisations have sought to challenge the UNFCCC’s REDD framing. To do this, descriptive codes were used to identify points of contention where non-governmental organisations argued that the REDD mechanism would cause effects that were not being taken into account in REDD calculations. That is, the analysis highlights where non-governmental organisations have identified *overflows* to the REDD framing. In the third stage of coding, the UNFCCC decisions and UNFCCC workshop reports were re-analysed to trace efforts made by the

³ There is a rich history of interpretive accounting research grounded in various philosophical and sociological traditions. See Hoque, Parker, Covalleski, and Haynes (2017) for useful discussion.

UNFCCC to respond to the challenges made by non-governmental organisations. To do this, descriptive codes were used to identify further devices brought into REDD's socio-technical arrangement that acted to reframe its space of calculability so as to address the concerns raised by non-governmental organisations. That is, this analysis highlights how the UNFCCC has sought to capture the overflows identified by non-governmental organisations in their written submissions.

At each stage, the emergent coding structure was reviewed for coherence, with the aim of creating a simple set of codes that could enable the extraction of key themes from the rich qualitative dataset (cf. Humphrey and Scapens, 1996; Scapens, 2004). This process of developing the emergent coding structure was aided by two visualisation techniques available within the NVivo software, which assisted with the exploration of the coded data. The first of these was a "word cloud" visualisation, which was used to provide assurance that the major themes within the documents had been captured within the coding structure. This visualisation is presented in Appendix 1. A second useful visualisation technique was a "dendrogram" of the descriptive codes, which was used to provide insight into clustering of descriptive codes within the dataset. This visualisation is presented in Appendix 2. Both visualisations were used for exploratory purposes, to support the close reading analysis and assist with the development of insights into the story of this case (Bazeley and Jackson, 2013). The final coding structure regarding the (re)framing and overflowing is presented in Appendix 3.

Two key themes emerged from this analysis: firstly, issues around the effects of REDD on the conservation of tropical forest biodiversity and, secondly, issues around the effects of REDD on the rights of forest-dwelling indigenous peoples⁴. Coherent narratives have been synthesised to explain key aspects of the identified overflows and the subsequent efforts by the UNFCCC to reframe REDD and capture these overflows. These synthesised narratives are presented in section 4 below. Firstly, the initial REDD framing by the UNFCCC is explained, then sub-section 4.1 presents the synthesised narrative concerning biodiversity, then sub-section 4.2 presents the synthesised narrative concerning indigenous peoples.

⁴ To provide assurance that these represent key themes within the dataset, a simple exact match text search was conducted, within NVivo, of the documents comprising the non-governmental organisation written submissions. The term "biodiversity" is used 1042 times in 119 different submissions, and the term "indigenous" is used 2500 times in 117 different submissions. These simple word counts may be seen to provide some support for the interpretation of this case (set out in section 4) derived from close reading analysis of these documents.

4. Creating financial value for tropical forests

When the idea of a REDD mechanism was first introduced to the UNFCCC in 2005, the United Nations Global Forest Resources Assessment was estimating that total global forest cover was decreasing by 13 million hectares per year (UN, 2005a). When forests are lost, the carbon stored in the trees, shrubs and soils is released into the atmosphere.⁵ Thus deforestation and forest degradation is a major source of greenhouse gas emissions, greater than the entire global transport sector (Greenpeace, 2018). Furthermore, tropical forests are vitally important for global biodiversity, containing approximately half of all species on Earth (Lindsey, 2007). Loss of tropical forest habitats, therefore, is a major cause of species extinction, contributing to what some biologists are calling a modern day mass extinction event (Barnosky et al., 2011; Ceballos et al., 2015). In addition, some 1.6 billion people, including some 200 million forest-dwelling indigenous peoples, are dependent on forests for their livelihoods (Chao, 2012).

Since the Rio Earth Summit in 1992, and the subsequent UN Convention on Biological Diversity, efforts to conserve tropical forests have revolved around two broad approaches. Firstly, countries have been establishing protected areas. Between 1990 and 2015, tropical forests in protected areas have risen from 12% to 26% (Morales-Hidalgo, Oswalt, & Somanathan, 2015). However, the remoteness of many of these areas, combined with a lack of financial resources for protection agencies, means that enforcement is often ineffective (Leverington, Costa, Pavese, Lisle, & Hockings, 2010). A second approach to tropical forest conservation has been the establishment of various forestry eco-labels, such as Forest Stewardship Council (FSC) certification, which are meant to signify that forest products have been produced from “well managed” forests (Elad, 2001, 2003). However, there has been considerable controversy over some of the forestry operations that have been granted these certifications, with concerns raised about their social and environmental impacts (Elad, 2000, 2014). Broadly, the use of protected areas and certification schemes has not been enough to relieve the economic pressures that lead to destruction of primary

⁵ The exact relationship between deforestation and greenhouse gas emissions is complicated by issues of timing of emissions (Houghton et al., 1983; Moore et al., 1981). Some emissions, such as from the burning of vegetation to clear land for agricultural use, or the burning of fuelwood, occur concurrently with deforestation. Some emissions, such as carbon released from soils following conversion to agricultural land, occur over several years following deforestation. Some emissions, such as the oxidation of paper and wood products, may occur several years (or even decades) after deforestation. Despite issues around timing of emissions, deforestation is a major source of greenhouse gas emissions, estimated to account for approximately 25% of anthropogenic greenhouse gas emissions (Houghton, 2005). The REDD mechanism makes a simplifying assumption that all emissions occur concurrently with deforestation, such that emissions from deforestation and forest degradation can be inferred from measured changes in forest carbon stocks (Gibbs, Brown, Niles, & Foley, 2007).

natural forests. The potential economic rewards of clearing forests, particularly for conversion to agricultural land, is too great for developing country governments to be able to instigate effective forest protection policies (Hosonuma et al., 2012). In their submission to the UNFCCC, first proposing the idea of a REDD mechanism, the Coalition of Rainforest Nations, led by the governments of Papua New Guinea and Costa Rica, highlighted the need to change the economic “rules of the game” for tropical forest protection:

[I]n the absence of revenue streams from standing forests, communities and governments in many developing nations have little incentive to prevent deforestation. As a consequence, communities must bear losses of the services from forests that are not valued economically, while globally, we all assume the consequences of increased greenhouse gases in the Earth’s atmosphere. It is estimated that tropical countries could reduce 1.5 GtC emissions from tropical deforestation over ten years and generate billions of dollars in conservation and climate change mitigation revenue. Without a more complete market valuation, standing forests cannot overcome the economic opportunity costs associated with their conservation (UN, 2005b, pp. 4-5).

Within this context, the UNFCCC brought REDD into its negotiation process in 2005, where it eventually became a component of the 2015 Paris Climate Change Agreement (UN, 2015). This Agreement essentially commits its signatories to a system of carbon accounting, whereby national governments set their own ‘nationally determined contributions to the global response to climate change’ (UN, 2015, p. 22) – i.e. their own targets for national greenhouse gas emissions – and then regularly report on their progress towards achieving these. Governments have two ways to reduce their reported emissions. One way is to actually reduce the levels of emissions resulting from their own national economic activity. But another way is for a government to enter into a deal to generate ‘internationally transferred mitigation outcomes’ (UN, 2015, p. 24), whereby it can finance activities to reduce emissions in another country and include those reductions of emissions in its own national carbon accounting, thus essentially offsetting its own national emissions.

REDD is one mechanism, within the Paris Agreement, for generating these kinds of national carbon offsets. Under the mechanism, a developing country can receive ‘results-based payments’ (UN, 2015, p. 23) for activities to reduce the greenhouse gas emissions caused by tropical deforestation within their national territory. In essence, a developed country can pay a developing country to undertake forest protection activities that demonstrably reduce emissions from tropical deforestation and, in return for these funds, the developed country can use the resulting emissions reductions to offset its own national emissions, thus helping

it to meet the emissions target it has set itself (its nationally determined contribution under the Paris Agreement).

Within the REDD mechanism, therefore, governments of forested developing countries are able to generate revenues from carbon emissions trading markets from forest protection activities. Consequently, forests become financially valuable to governments because they provide access to these revenues. That is, the REDD mechanism does not directly provide a valuation of any particular area of forest, or for the carbon stored within the forest. Rather, the forests become valuable because having standing forests is a necessary prerequisite for engaging in forest protection activities. It is these activities, which are understood to reduce emissions caused by deforestation and forest degradation, that generate revenues for governments. So, the UN's aim to 'make forests more valuable standing than they would be cut down' (UN, 2010a, p. 1) is being pursued by creating an opportunity for governments to earn more revenues from forest protection activities than they would otherwise have earned from clearance of forests for timber and/or agricultural land.⁶

The challenge for a developing country government, therefore, is to be able to demonstrate that their forest protection activities have actually produced measurable results in terms of greenhouse gas emissions reductions. Thus for REDD to function – to be able to create a financial value for tropical forests – developing country governments must construct a metrological system for identifying and quantifying reductions in emissions from deforestation and forest degradation, resulting from forest protection activities.

Such a metrological system comprises two key devices. Firstly, developing country governments must establish a 'robust and transparent national forest monitoring system' (UN, 2010b, p. 13) that is able to track ongoing changes over time in the overall stock of carbon stored in the forest. Secondly, developing country governments must establish a 'national forest reference emission level' (UN, 2010b, p. 12), which establishes a "business-as-usual" baseline level of emissions from deforestation and forest degradation that would have occurred in the absence of REDD forest protection activities. The measured reductions in carbon emissions from deforestation and forest degradation, resulting from REDD forest protection activities, will therefore be the difference between the actual monitored emissions (i.e. monitored changes in forest carbon stocks) and the hypothetical

⁶ It is beyond the scope of this paper to review debates about the merits and drawbacks of specific valuation approaches. For an insightful discussion of approaches to valuing environmental resources, see Milne (1991). For discussion and critique of the valuation approach implicit within the REDD mechanism, see Karsenty (2008), Neeff and Ascui (2009), Cuckston (2013), and Rakatama, Pandit, Ma, and Iftekhar (2017).

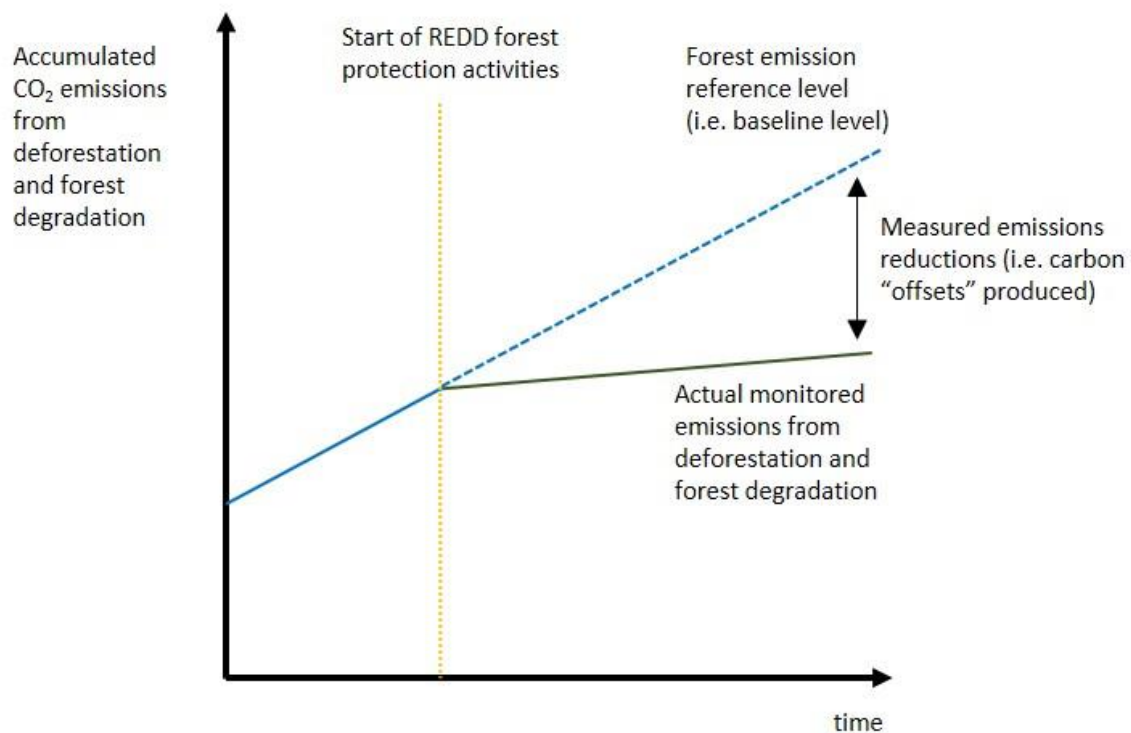


Figure 1: Over time, developing country governments can earn revenues for REDD forest protection activities by demonstrating that actual monitored emissions are less than the established “business-as-usual” baseline.

forest reference emission level. In this way, over time, governments can demonstrate a reduction in carbon emissions from deforestation and forest degradation, when compared to the “business-as-usual” baseline (see figure 1). These measured carbon emissions reductions can then be marketed as “carbon offsets” and sold to developed countries.

The construction of both devices comprising the REDD metrological system – the forest monitoring system and the forest reference emission level – has been made possible by substantial developments and growth in the availability of satellite-based remote sensing technology. Indeed, it has been technological advances in this field, so as to enable, ‘the measurement of changes in land cover at the national and international scales with confidence’ that has made REDD a feasible option for the UNFCCC’s efforts to mitigate climate change (UN, 2006, p. 5). Remote-sensing, enabling the forests to be viewed from above, means that ongoing changes in forest cover can be monitored directly. Furthermore,

historic satellite imagery of forest cover can be used to establish a baseline rate of loss of forest cover that forms the basis of a country's forest reference emission level⁷.

With a metrological system in place, therefore, REDD constructs a socio-technical arrangement that frames the relation between a developing country government and the tropical forest within its national territory so as to render this relation calculable. That is, forest protection activities by governments are understood to produce results in terms of emissions reductions, which can be measured as differences between monitored changes in forest carbon stocks and a country's established reference emission level. A developing country government can, therefore, within this arrangement, clearly see and comprehend that tropical forest protection can bring financial rewards from effectively selling carbon offsets. Thus forests become seen and understood by developing country governments as having financial value: i.e. the calculation of financial value for tropical forests becomes possible.

The work of creating conditions of possibility for calculating financial value for tropical forests under the REDD mechanism may be seen to be work to disentangle developing country governments from their tropical forests. Seen from the distance of space, forests become simply a mass of carbon that can be readily quantified and measured. All the ecological complexities – all the intricate, interconnected networks of life and death – that comprise a tropical forest become invisible from this distance, and thus alien to people who survey the forests from this overhead perspective. Furthermore, by setting a baseline that represents the future of forests in the absence of REDD forest protection activities, the complex interactions between government policies and actions, on the one hand, and tropical forests, on the other hand, are reduced down to a single, apparently straightforward, causal connection. That is, the counterfactual scenario envisaged in the baseline is normalised: it is framed as a future without government action (as opposed to a future in which governments continue to be complicit in tropical forest destruction). Governments are thus not framed as an integral part of a socio-ecological system that is organised in a way that results in deforestation. Rather, governments are framed as agents, external to this system, that are able to intervene in the system so as to reduce deforestation. In order to establish a straightforward causal link between government action and reduced emissions from deforestation and forest degradation, therefore, the REDD mechanism first disentangles governments from forests. Consequently, REDD activities may be framed as actions upon

⁷ The establishment of baseline levels of emissions from historical data is not straightforward. Indeed, the REDD mechanism also allows governments to adjust an observed historical deforestation rate for 'relevant policies and plans' (UN, 2014, p. 34) that could affect future deforestation. For a full discussion of the difficulties of establishing emissions baselines see Lohmann (2009).

the forests so as to produce the results of reduced greenhouse gas emissions: results that can earn the government financial revenues under the mechanism. The alienation of governments from forests – of people from nature – is a necessary prerequisite for rendering calculable the relation between them, such that calculation of financial value for forests becomes possible.

The UNFCCC has constructed a socio-technical arrangement that frames developing country government actions to reduce carbon emissions from deforestation and forest degradation. Framing government actions in this way makes it possible for governments to earn revenues from carbon trading markets as a result of their forest protection activities. Thus, within this framing, tropical forests become financially valuable. However, as explained in section 2, Callon (1998b) warns that no framing is ever perfect or complete. All framings may be challenged on the basis that material relations overflow the framing, causing effects that are not taken into account in calculations. In the case of the framing of the government-forest relation just described, two such overflows have formed the basis of prominent challenges to the calculability achieved by the REDD mechanism within UNFCCC negotiations (see figure 2). Firstly, some non-governmental organisations raised concerns that the REDD mechanism could incentivise the conversion of natural (biologically diverse) forests into (biologically impoverished) plantations. They argued that this meant the REDD mechanism could cause the loss of tropical forest biodiversity. The concerns raised (i.e. the identified overflow) and the UNFCCC's response (i.e. the efforts at reframing) are outlined

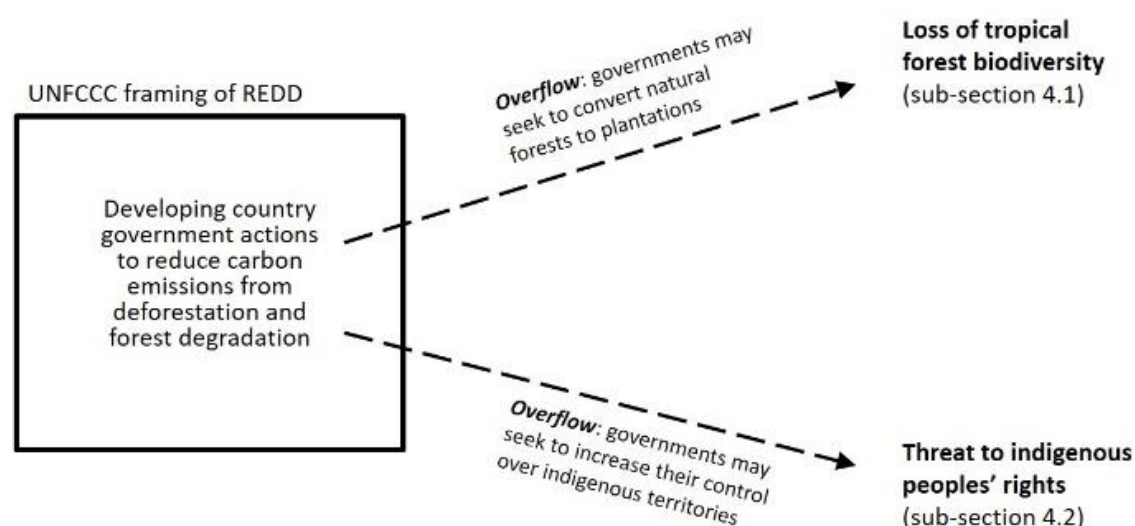


Figure 2: Non-governmental organisations identified potential effects of the REDD mechanism that could overflow the UNFCCC's framing of forest protection activities.

below in sub-section 4.1. Secondly, some non-governmental organisations raised concerns that the REDD mechanism could incentivise developing country governments to try to increase their control over tropical forests, including in the territories of forest-dwelling indigenous peoples. They argued that this meant the REDD mechanism could become a substantial threat to the rights of indigenous peoples to control their own territories. The concerns raised (i.e. the identified overflow) and the UNFCCC's response (i.e. the efforts at reframing) are outlined below in sub-section 4.2.

4.1 Tropical forest biodiversity

A major challenge to the calculability achieved by the REDD mechanism is that it creates conditions which could incentivise actions that are detrimental to tropical forest biodiversity. Tropical forests contain approximately 80% of the world's terrestrial species (Groombridge & Jenkins, 2002). Yet the financial value of tropical forests, under the REDD mechanism, is derived only from forests' capacity to store carbon. As such, some non-governmental organisations expressed concern that the REDD mechanism could not guarantee protection of tropical forest biodiversity.

It would be perverse to develop a system to protect the Earth's climate which would not be designed to protect its inhabitants. Yet [REDD] would render the protection of vulnerable species to mere chance (Greenpeace, 2008, p. 4).

Under REDD, governments devise their own national strategies for reducing emissions from deforestation and forest degradation and, crucially, this can include activities aimed at 'enhancement of forest carbon stocks' (UN, 2007a, p. 10). As such, there has been much concern that an easy option for governments looking to generate carbon revenues from the REDD mechanism is to establish plantation forests. Under the carbon accounting of a REDD metrological system, plantation forests and natural forests look the same: both are simply stores of carbon. However, plantation forests are ecologically impoverished compared to natural old growth forests:

Plantations contain only a fraction of the ... biodiversity that natural forests have and should therefore not be included in the definition of 'forest'. Positive incentives aimed at sustaining standing forests must not end up profiting plantations (Rainforest Foundation, FERN, & Friends of the Earth International, 2008, p. 1).

If governments can profit under REDD from establishing plantation forests, then they are less likely to be concerned with the protection of biologically diverse natural tropical forests.

Thus REDD potentially creates conditions that incentivise a conversion of natural forests to plantations. Such a conversion may appear to reduce emissions from deforestation and forest degradation and thus earn results-based payments under a REDD mechanism, but it would be ecologically catastrophic.

[T]he replacement of natural forests by monoculture tree plantations is considered to be a form of deforestation by those who foster a definition of forests based on biological science (Global Forest Coalition, 2007, p. 1).

Agricultural tree crops should not qualify as 'forests' and conversion of native, intact, biodiverse, carbon-rich forests into agricultural tree crop plantations must qualify as 'deforestation' (SustainUS, 2008, p. 2)

The relation between government actions within the REDD mechanism and tropical forest biodiversity is, therefore, seen to overflow the UNFCCC's framing of the government-forest relation within the REDD mechanism, thus threatening the calculability achieved by REDD. Consequently, the UNFCCC engaged in further work to try to capture and contain this overflowing relation. Within a set of 'safeguards' (UN, 2010b, p. 26) for REDD activities, the UNFCCC specified that such activities should be 'consistent with the conservation of natural forests and biological diversity ... [and] not used for the conversion of natural forests' (UN, 2010b, pp. 26-27). This safeguard for REDD activities may be seen to be a further device in the socio-technical arrangement constituting the REDD mechanism. It is a device that establishes a clear distinction between natural and non-natural (i.e. plantation) forests, prohibiting conversion of the former to the latter. In this way, the safeguard aims to capture and contain the overflowing relation between government actions under REDD and tropical forest biodiversity because, by ensuring conservation of natural forests, biological diversity should supposedly be maintained.

However, in bringing in this device so as to reframe the government-forest relation under REDD, the safeguard has the effect of creating conditions for further overflows. Of particular concern to many conservation organisations was that framing forests as either natural or non-natural ignored the potential of some REDD activities to cause ecological degradation of forests that does not amount to full conversion to plantations. In particular, the UNFCCC agreement on REDD specifies that so-called 'sustainable management of forests' (UN, 2007a, p. 8) is an activity that is eligible for generating results-based payments under the mechanism. But this notion (often referred to as sustainable forest management, or SFM), which encompasses various forms of selective logging, rather than total clearance of forests, has been widely criticised on the basis that 'there is no common understanding of

[sustainable forest management] and it is misused to promote management that is not sustainable' (Global Witness & The Wilderness Society, 2008, p. 1).⁸

Sustainable Forest Management as usually practiced involves dividing a large area of forest (ranging from several thousand hectares to hundreds of thousands of hectares) into approximately 25-30 units, and then logging one unit each year. One rotation is completed once each unit has been logged. In theory, timber is extracted at such a rate so that at the end of the 25-30 year rotation the first unit is ready to be logged again, and so on in perpetuity (known as sustained yield). In reality, in the tropics even a 30 year rotation is ecologically unsustainable (Global Witness, 2012, p. 4).

Sustainable management of forests does not involve wholesale conversion of natural forests. Thus it does not fall foul of the safeguard that prohibits such conversion. However, selective logging activities can radically alter the ecological conditions that persist in forests. Certain high timber value trees are often targeted, thus changing the composition of tree species within a forest and denying habitats to numerous flora and fauna species that depend in some way on these targeted tree species. Furthermore, logging requires access to the trees and so leads to the building of roads and other infrastructure, which fragments the forest, damaging its ecological integrity.

Sustainable forest management should only be promoted in forests that have been subject to logging and clearing. It is undesirable for intact primary forests from a climate and biodiversity perspective (Wilderness Society, 2008, p. 2).

[E]ven the most selective logging operations damage primary forests leaving behind biologically impoverished secondary growth (Global Witness, 2012, p. 4).

The work of bringing in the safeguard device to the socio-technical arrangement comprising the REDD mechanism may be seen to be further work to disentangle developing country governments from their tropical forests. By classifying forests as natural or non-natural, the safeguard produces a greater distance between governments and tropical forest biodiversity. This is achieved by reducing the complexities of ecological degradation caused by exploitation of the forests to a simple natural/non-natural dichotomy. If governments are not causing wholesale conversion of natural forests to non-natural plantations, then they are

⁸ The United Nations General Assembly has defined sustainable forest management as 'a dynamic and evolving concept [that] aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations' (UN, 2007b, p. 9). Many conservation organisations argue that this definition is 'so vague it can mean anything' (Ecosystems Climate Alliance, 2009, p. 5).

deemed by the REDD mechanism to be complying with the safeguard and thus not causing ecological degradation. The perceived relation between government activities and ecological degradation of tropical forests is thus greatly simplified. This disentanglement and distancing of governments from forest biodiversity creates conditions in which biologically impoverished “sustainably managed” forests are seen and understood as being just as natural, and therefore just as financially valuable under the REDD mechanism, as pristine primary forests. This form of calculability, achieved by the REDD mechanism with the safeguard device brought into it, cannot guarantee protection of tropical forest biodiversity.

The unique role of intact tropical forests in fostering biodiversity means that the ecosystem is highly vulnerable to disturbance from logging. It can take as long as 4,000 years for a logged forest to attain previous levels of species diversity, and that is only if it is allowed to recover undisturbed. **The end point of the decline in species populations put in train by SFM [i.e. sustainable forest management] is extinction** (Global Witness, 2012, pp. 5-6, emphasis in original).

The safeguard device has been deployed by the UNFCCC to address challenges to the calculability achieved by the REDD mechanism, based on the potential effects of REDD activities on tropical forest biodiversity. But the device has done this by further disentangling government actions from their effects on tropical forest biodiversity. That is, in order to maintain conditions of possibility for calculation of financial value for tropical forests, further work has been undertaken by the UNFCCC to preserve and reinforce the alienation, within the REDD mechanism, of people from nature.

4.2 Forest-dwelling indigenous peoples

Another major challenge to the calculability achieved by the REDD mechanism is that it creates conditions which could incentivise actions that are detrimental to the lives and livelihoods of forest-dwelling indigenous peoples. There have long been conflicts over land rights between governments and indigenous peoples (Chatty & Colchester, 2002). The UNFCCC's REDD mechanism has raised fears that creating a financial value for tropical forests will encourage governments to adopt what one indigenous rights organisation has described as an ‘anti-people ‘guns and guards’ approach to forest protection’ (Forest Peoples Programme, 2009a, p. 24).

If standing forests increase in value because of the application of positive incentives under REDD, they may be declared 'off limits' to the communities that live in them or depend on them for their livelihoods, with serious social impacts, including displacement, conflict and violence (Global Forest Coalition, 2008, p. 2).

The threat posed by the REDD mechanism to indigenous peoples, whereby national governments might use the mechanism as a way to intensify their control of forest territories, thereby weakening indigenous claims to the land, was seen to run directly counter to the United Nations General Assembly's adoption, in 2007, of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). The UNDRIP is not legally binding on states but it does recognise numerous obligations of national governments, including that they should not seek to unilaterally impose policies upon indigenous peoples:

States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources (UN, 2007c, p. 12).

Indigenous peoples' groups have seen REDD as posing a threat to the rights recognised by the UNDRIP, because governments may try to impose their own forest protection methods upon indigenous territories without consent.

[R]espect for the rights and interests of indigenous peoples and local communities, including their rights to land, territories and resources, their traditional uses of the forest, and their rights to free, prior, informed consent and to choose their own development pathways, must be an integral part of any REDD mechanism (Climate Action Network International, 2009, p. 1).

This challenge to the calculability achieved by the REDD mechanism, therefore, is made on the basis that there is a relation between government activities under REDD and the internationally recognised rights of forest-dwelling indigenous peoples that overflows the REDD framing. That is, indigenous peoples fear that the arrangement of the REDD mechanism means that indigenous peoples' rights will not be taken into account in the REDD calculations of national governments.

Indigenous peoples have expressed serious concerns that current plans for [REDD] ... pose serious threats to their rights and welfare. If binding commitments are not forthcoming to safeguard rights and if methods are adopted without agreement of indigenous peoples, then there are dangers that climate change mitigation

instruments, including REDD, may have serious negative social and poverty impacts (Forest Peoples Programme, 2009b, p. 3).

In response, the UNFCCC engaged in further work to try to capture and contain this overflowing relation. Within the safeguards for REDD activities, the UNFCCC specified that such activities should be undertaken with '[r]espect for the knowledge and rights of indigenous peoples ... [and with] full and effective participation of relevant stakeholders, in particular indigenous peoples' (UN, 2010b, p. 26).

The addition of this safeguard device into the socio-technical arrangement constituting the REDD mechanism seeks to establish indigenous peoples as *participants* in REDD: *stakeholders* with rights and interests in the mechanism. This framing of indigenous peoples as participants in the REDD mechanism has been taken up by some conservation organisations, who advocate that indigenous peoples' participation in REDD is necessary if the mechanism is to successfully protect tropical forests:

[I]ndigenous peoples must have financial incentives to manage forests sustainably. This can be achieved by clarifying and recognising land tenure rights of local communities, devolving management responsibility to local residents, sharing the responsibility between local residents and government, or by granting concessions to the community (Ecosystems Climate Alliance, 2009, p. 7).

Further, some organisations have sought to equip indigenous peoples to be able to participate effectively in the REDD mechanism by developing training materials (Erni & Tugendhat, 2012; Silverman, 2014; UNU-IAS, 2009). Thus the safeguard device may be seen to be acting to create conditions in which indigenous peoples can take on a new relation to forests, as potential beneficiaries of the financial value of the forests under the REDD mechanism. This framing of indigenous peoples' relation with their forests stands in stark contrast to how indigenous peoples' organisations have consistently sought to frame that relation:

Forest lands and ecosystems provide wild plant and animal foods, fibres, medicines, construction and craft materials used in subsistence and cultural practices ... For indigenous peoples, forests and forest resources are also imbued with critical spiritual values that sustain ceremonial and religious activities and ways of life. Natural forests therefore meet material, food and livelihood needs and underpin the cultural systems and distinct identities of indigenous peoples and traditional forest dwellers. Indigenous peoples and community-based organisations have long stressed that forests cannot be reduced to narrow economic inventories. They

emphasise that the multiple economic, biological, social, cultural and spiritual values of forests need to be recognised and respected (Forest Peoples Programme, 2009b, pp. 16-17).

The REDD mechanism, when it includes the safeguard device framing indigenous peoples as participants in the mechanism, may be seen to be acting to try to disentangle the interconnected complex of interactions between indigenous peoples and forests, so as to render this relation calculable. That is, the cultural/spiritual value of forests to indigenous peoples is excluded from REDD's space of calculability, and a new form of value – a financial value based on carbon storage – is being introduced to them. Within their participation in the REDD mechanism, the cultural and spiritual interconnections of indigenous peoples with the forests must be cut and replaced with the single calculable relation that REDD establishes. Only through such disentanglement can indigenous peoples be made to see and understand their interests in the newly created financial value of their forests under the REDD mechanism. But some conservation organisations have warned that this work to disentangle indigenous peoples from the ways that they have traditionally understood and valued their forests – as 'irreplaceable repositories of cultural and spiritual heritage' (CBD, 2009, p. 1) – risks 'undermining the very value systems that have made forest conservation a success in so many communities' (Global Forest Coalition, 2012, p. 4). That is, the REDD framing of tropical forest protection is 'based on the assumption ... that financial gains are by far the main motivation for human action ... [and] that financial contributions are the only incentive that will trigger action to conserve forests' (Global Forest Coalition, 2013, p. 11). Consequently, by requiring indigenous peoples' participation in the REDD mechanism, the UNFCCC risks eroding indigenous peoples' cultural and spiritual motivation for conservation, by bringing them into a value system whereby 'there is an obligation to conserve forests only when one is paid for it' (Global Forest Coalition, 2012, p. 7).

It may be that indigenous peoples will be able to maintain their own value systems alongside their participation in REDD. But participation requires the adoption of a different kind of identity in relation to forests: the identity of an economic agent seeking financial reward. Over time, this identity may come to dominate the identity that indigenous peoples have traditionally adopted for themselves, as stewards and guardians of the cultural and spiritual value of forests. If this were to happen then the continued impetus of indigenous peoples to protect forests would come to depend on continued financial revenues. Importantly, this is not simply an argument that assigning financial value to forests will encourage an instrumental mindset (Barter, 2015; Hines, 1991; Lehman, 1996, 2017). Rather, the adoption of an instrumental mindset is seen here to be something that is necessary for

bringing indigenous peoples into the socio-technical arrangement that creates the conditions of possibility for calculating financial value for forests. The work of disentangling forest-dwelling indigenous peoples from their cultural and spiritual understandings of the forest – i.e. the alienation of people from nature – is seen here to be a prerequisite for achieving a calculability that enables the REDD mechanism to create a financial value for tropical forests.

5. Concluding discussion

This paper began by problematizing a recurring critique within the accounting literature of the proliferation of mechanisms to create financial value for nature as a response to environmental problems. Drawing on theoretical developments in the social studies of finance (Callon, 1998a; MacKenzie, 2009b; Vollmer et al., 2009), this paper has argued that this recurring critique, whereby the placing of financial values on nature is seen to perpetuate an instrumental mindset that alienates people from nature (Barter, 2015; Hines, 1991; Lehman, 1996, 2017), does not explain the full extent of how the creation of financial value for nature gives rise to this alienation. That is, this paper has argued that alienation of people from nature is a consequence of the work of disentanglement and framing of the relation between people and nature that is necessary to create conditions of possibility for calculating such financial value.

In order to pursue and progress this argument, this paper has analysed a particular case – the UNFCCC's REDD mechanism – wherein humanity's response to the environmental problem of tropical deforestation is seen to be to 'make forests more valuable standing than they would be cut down, by creating a financial value for the carbon stored in trees' (UN, 2010a, p. 1). This paper has sought to explain the work that the UNFCCC has done to construct a socio-technical arrangement that frames a space of calculability in which the calculation of financial value for tropical forests has been made possible.

This analysis identified key aspects of this work of disentanglement and framing that has rendered calculable the relation between developing country governments and their forests. A metrological system was constructed comprising two important devices: (i) a national forest monitoring system for measuring ongoing changes in forest carbon stocks, and (ii) a national forest reference emission level establishing a baseline of forest carbon emissions against which reductions in emissions resulting from forest protection activities can be measured. The analysis showed that this metrological system acts to disentangle the actions of developing country governments from the socio-ecological complexities of tropical

deforestation – i.e. disentangles people from nature – so as to render calculable the relation between governments and forests, such that the calculation of financial value for forests becomes possible.

However, this metrological system was also seen to create conditions for other material relations to overflow the framing of this government-forest relation. Two such overflowing relations, which have formed the basis of prominent challenges to the calculability achieved by the REDD mechanism, were identified concerning (i) tropical forest biodiversity and (ii) forest-dwelling indigenous peoples. In both instances, forest protection activities under the REDD mechanism were seen as a potential threat which is excluded from the REDD space of calculability and thus ignored in REDD calculations. In both instances the UNFCCC has sought to introduce further devices – safeguards for REDD activities – into the socio-technical arrangement comprising the REDD mechanism so as to try to capture and contain these overflowing relations. In both instances these safeguarding devices were seen to act to further disentangle, and thus alienate, people from forests. In both instances, this further disentanglement and alienation was seen to create conditions that potentially threaten to materially degrade non-financial (i.e. ecological and cultural/spiritual) forms of the value of tropical forests.

What this analysis has shown, therefore, is that, in the case of the REDD mechanism, the alienation of people from nature was not merely an effect of the financial valuation of nature. Rather, the alienation of people from nature was a consequence of the work of materially disentangling people from nature so as to create conditions of possibility for the calculation of that financial value. As such, the alienation of people from nature is seen to be a necessary prerequisite for creating financial value for nature.

There are important implications of this analysis for policy and research. Crucially, this analysis points to a possible new direction for efforts to counter the ongoing alienation of people from nature. Extant literature, which sees this alienation as an effect of the instrumental mindset encouraged by financial valuation, tends to argue that the mechanisms that create financial value for nature must, therefore, be opposed (McNicholas & Windsor, 2011; Sullivan & Hannis, 2017). Only by doing so, it is argued, can we hold on to our sense of nature's intrinsic value (Christian, 2014; Hines, 1991). But this would seem to be a futile effort in a world that has become, and is increasingly becoming, dominated by a neoclassical economic paradigm in which financial valuation is paramount (Atkins, Atkins, Thomson, & Maroun, 2015; Gray, 2010; Jones, 2010; Milne & Gray, 2013). If, however, we recognise this alienation of people from nature as being something that is materially engineered through the construction of socio-technical arrangements, then efforts to counter this

alienation can focus on ways to affect change in the configuration of these arrangements (see also Cuckston, 2017). What new devices can be designed and deployed so as to change the people-nature relations that are brought into account within spaces of calculability? How can overflowing people-nature relations be effectively identified and then, crucially, captured and contained in ways that do not lead to further alienation? Can, for example, REDD safeguards be designed and deployed in ways that somehow bring considerations of ecological and spiritual/cultural value into REDD's space of calculability, rather than excluding these forms of value? These are questions for policy-makers, for non-governmental organisations, and for accounting researchers interested in bringing people and nature back together (cf. Russell, Milne, & Dey, 2017). These kinds of questions are especially relevant for researchers concerned with the effects of social and environmental accounting in emerging and less developed economies (see special issue in *Accounting Forum*, especially Belal, Cooper, and Roberts (2013) and Momin (2013)).

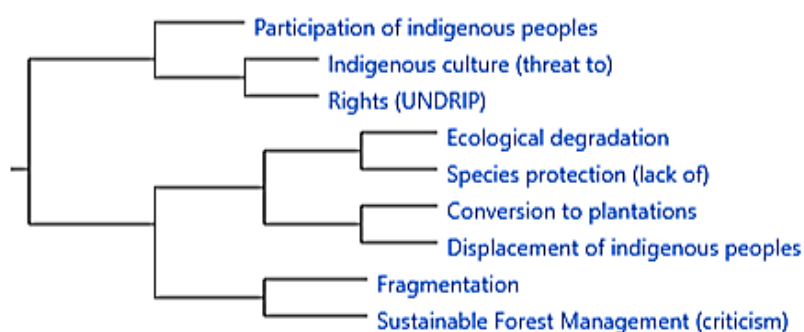
Of particular relevance to these questions is the role of indigenous peoples in nature conservation. Extant literature has documented that some indigenous peoples are able to understand and manage their territories in ways that protect nature (Whiteman & Cooper, 2000, 2011). The ways that some indigenous cultures conceptualise their relationship with nature, and the consequent value of nature, stands in stark contrast to the financial valuation approach that currently dominates Western environmental policy (Craig, Taonui, & Wild, 2012; Greer & Patel, 2000). Indeed, Gallhofer, Gibson, Haslam, McNicholas, and Takiari (2000) argue that environmental accounting needs to learn from the knowledge and practices of indigenous peoples:

The earth should not be dominated or exploited as if it were our enemy. Rather, we should aim to live in harmony and in a balanced relationship with it. We are part of the earth, and the earth is an interconnected whole ... Such concerns, taken seriously, help preserve and enhance the environment ... accounting can help remind us of what matters and focus attention upon what is of value to us in a way that is more consistent with a more holistic and environmentally conscious perspective (Gallhofer et al., 2000, pp. 391-392).

Extant literature also documents that accounting has been used in numerous contexts to suppress indigenous peoples' cultures and deny them basic rights (Davie, 2000; Davie & McLean, 2017; Lombardi, 2016; Neu, 2000). Indeed, this is akin to the concerns raised by non-governmental organisations about how the REDD mechanism could be used by governments to assert increased control over indigenous peoples' territories. What the present paper has shown, however, is that subsequent efforts to address these concerns, by

Appendix 2: “Dendrogram” visualisation, generated by NVivo

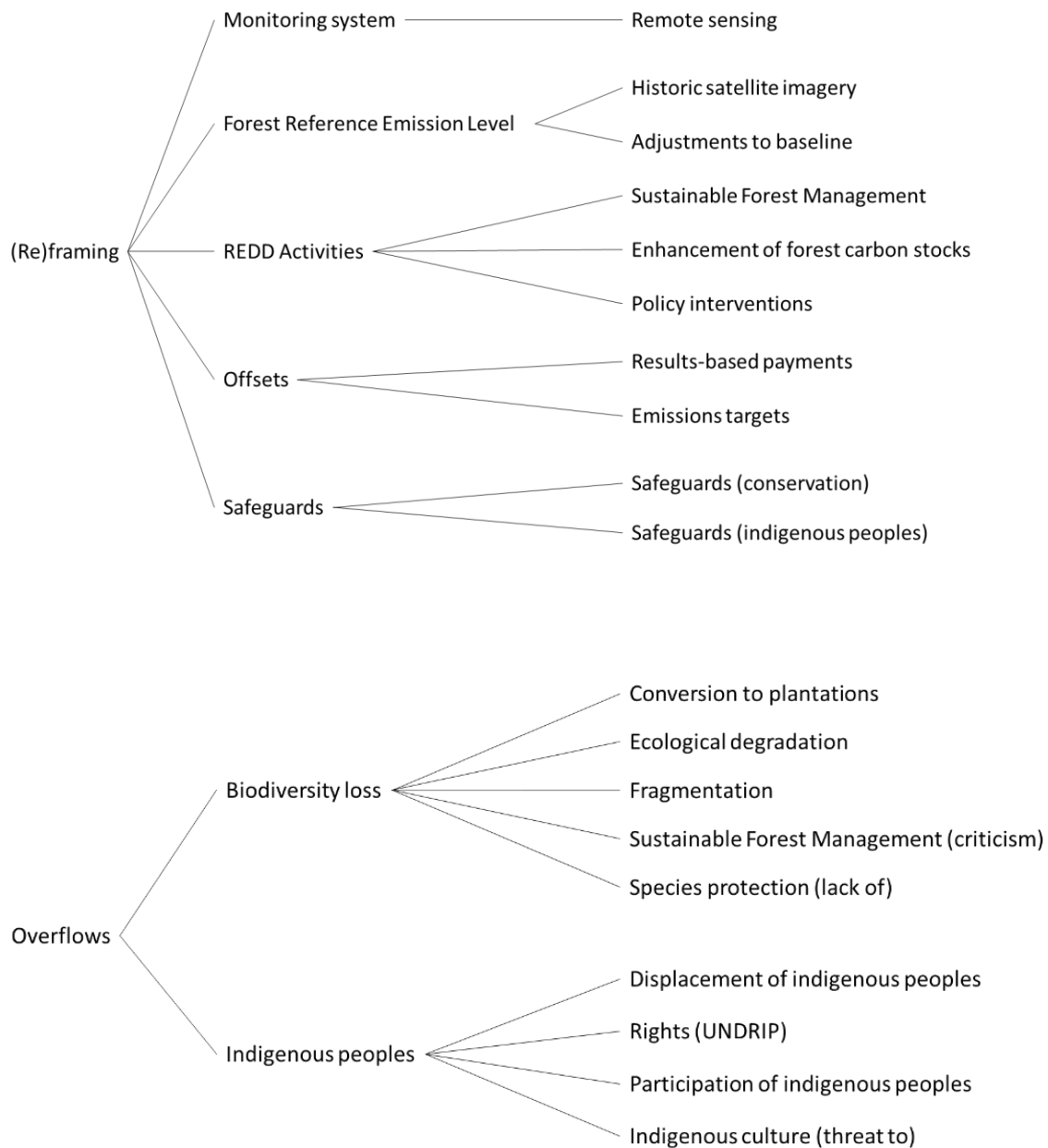
This visualisation clusters descriptive codes together based on their occurrence within the same source documents. This visualisation was used to explore the associations within the descriptive coding so as to inform the development of the emergent coding structure. The below visualisation shows the clustering of the final set of descriptive codes relating to *overflows* identified within the 177 written submissions of the non-governmental organisations.



This visualisation shows that there are two broad themes within the coding, with issues concerning the participation, culture and rights of indigenous peoples on the one hand, and issues concerning the conservation of natural forests on the other. Interestingly, displacement of indigenous peoples is closely clustered with conversion of natural forests into plantations, ecological degradation and lack of species protection. This highlights an important link between the two broad themes, whereby indigenous peoples’ livelihoods are seen to depend on the ecological integrity of natural forests.

Appendix 3: Final emergent descriptive coding structure

The first diagram shows the emergent coding structure relating to framing (and reframing), derived from the coding of the UNFCCC decisions and workshop reports. This structure begins with identifying devices within the REDD mechanism (monitoring system, forest reference emission level, REDD activities, offsets, and safeguards) and then identifies important aspects of these devices that impact on the calculability achieved by the REDD mechanism. The second diagram shows the coding structure relating to *overflows* identified within the written submissions of non-governmental organisations. These are organised into two key themes: biodiversity loss and indigenous peoples.



References

- ACCA, Flora and Fauna International, & KPMG. (2012). *Is natural capital a material issue? An evaluation of the relevance of biodiversity and ecosystem services to accountancy professionals and the private sector*. Glasgow: Association of Chartered Certified Accountants.
- Andrew, J., Kaidonis, M. A., & Andrew, B. (2010). Carbon tax: challenging neoliberal solutions to climate change. *Critical perspectives on accounting*, 21(7), 611-618.
- Atkins, J., Atkins, B., Thomson, I., & Maroun, W. (2015). "Good" news from nowhere: imagining utopian sustainable accounting. *Accounting, auditing and accountability journal*, 28(5), 651-670.

- Barnosky, A., Matzke, N., Tomiya, S., Wogan, G., Swartz, B., Quental, T., Marshall, C., McGuire, J., Lindsey, E., Maguire, K., Mersey, B., & Ferrer, E. (2011). Has the Earth's sixth mass extinction already arrived? *Nature*, 471, 51-57.
- Barter, N. (2015). Natural capital: dollars and cents/dollars and sense. *Sustainability accounting, management and policy journal*, 6(3), 366-373.
- Belal, A., Cooper, S., & Roberts, R. (2013). Vulnerable and exploitable: the need for organisational accountability and transparency in emerging and less developed economies. *Accounting forum*, 37(2), 81-91.
- Birkin, F. (1996). The ecological accountant: from the cogito to thinking like a mountain. *Critical perspectives on accounting*, 7, 231-257.
- Boiral, O. (2016). Accounting for the unaccountable: biodiversity reporting and impression management. *Journal of business ethics*, 135, 751-768.
- Callon, M. (1998a). The embeddedness of economic markets in economics. In M. Callon (Ed.), *The laws of the markets* (pp. 1-57). Oxford: Blackwell.
- Callon, M. (1998b). An essay on framing and overflowing: economic externalities revisited by sociology. In M. Callon (Ed.), *The laws of the markets* (pp. 244-269). Oxford: Blackwell.
- Callon, M. (1999). Actor-network theory - the market test. *The sociological review*, 47(51), 181-195.
- CBD. (2009). *Views on issues relating to indigenous peoples and local communities for the development and application of methodologies: submission from the secretariat of the Convention on Biological Diversity*. Bonn, Germany: United Nations Framework Convention on Biological Diversity.
- Ceballos, G., Ehrlich, P., Barnosky, A., Garcia, A., Pringle, R., & Palmer, T. (2015). Accelerated modern human-induced species losses: entering the sixth mass extinction. *Science Advances*, 1(5), e1400253.
- Chao, S. (2012). *Forest Peoples: Numbers across the world*. Moreton-in-Marsh: Forest Peoples Programme.
- Chatty, D., & Colchester, M. (2002). *Conservation and mobile indigenous peoples: displacement, forced settlement and sustainable development*. Oxford: Berghahn Books.
- Christian, J. (2014). Accounting for biodiversity - a deep ecology perspective. In M. Jones (Ed.), *Accounting for biodiversity* (pp. 124-145). Oxford: Routledge.
- Climate Action Network International. (2009). *Views on issues relating to indigenous peoples and local communities for the development and application of methodologies*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Craig, R., Taonui, R., & Wild, S. (2012). The concept of taonga in Maori culture: insights for accounting. *Accounting, auditing and accountability journal*, 25(6), 1025-1047.
- Cuckston, T. (2013). Bringing tropical forest biodiversity conservation into financial accounting calculation. *Accounting, auditing and accountability journal*, 26(5), 688-714.
- Cuckston, T. (2017). Ecology-centred accounting for biodiversity in the production of a blanket bog. *Accounting, auditing and accountability journal*, 30(7), 1537-1567.
- Cuckston, T. (2018). Making extinction calculable. *Accounting, auditing and accountability journal*, 31(3), 849-874.
- Davie, S. (2000). Accounting for imperialism: a case of British-imposed indigenous collaboration. *Accounting, auditing and accountability journal*, 13(3), 330-359.
- Davie, S., & McLean, T. (2017). Accounting, cultural hybridisation and colonial globalisation: a case of British civilising mission in Fiji. *Accounting, auditing and accountability journal*, 30(4), 932-954.
- Deegan, C. (2013). The accountant will have a central role in saving the planet ... really? A reflection on 'green accounting and green eyeshades twenty years later'. *Critical perspectives on accounting*, 24, 448-458.

- Deegan, C. (2017). Twenty five years of social and environmental accounting research within Critical Perspectives on Accounting: hits misses and ways forward. *Critical perspectives on accounting*, 43, 65-87.
- Ecosystems Climate Alliance. (2009). *Response to calls for submissions on the UNFCCC processes*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Elad, C. (2000). *Environmental management accounting for sustainable development: an evaluation of policy and practice in the forestry sector in Cameroon*. London: Chartered Institute of Management Accountants.
- Elad, C. (2001). Auditing and governance in the forest industry: between protest and professionalism. *Critical perspectives on accounting*, 12, 647-671.
- Elad, C. (2003). Forest stewardship audit. *Financiele Studievereniging Rotterdam*, 5(5), 6-12.
- Elad, C. (2014). Forest certification and biodiversity accounting in the Congo basin countries. In M. Jones (Ed.), *Accounting for biodiversity* (pp. 189-211). Oxford: Routledge.
- Erni, C., & Tugendhat, H. (2012). *What is REDD+? A guide for indigenous communities*. Chiang Mai: Asia Indigenous Peoples Pact.
- Ferreira, C. (2017). The contested instruments of a new governance regime: accounting for nature and building markets for biodiversity offsets. *Accounting, auditing and accountability journal*, 30(7), 1568-1590.
- Forest Peoples Programme. (2009a). *Seeing 'REDD'? Forests, climate change mitigation and the rights of indigenous peoples and local communities*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Forest Peoples Programme. (2009b). *Views on issues relating to indigenous peoples and local communities for the development and application of methodologies: a paper submitted in response to an invitation to accredited observers to submit views on indigenous peoples and local communities*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Gallhofer, S., Gibson, K., Haslam, J., McNicholas, P., & Takiari, B. (2000). Developing environmental accounting: insights from indigenous cultures. *Accounting, auditing and accountability journal*, 13(3), 381-409.
- Gibbs, H., Brown, S., Niles, J., & Foley, J. (2007). Monitoring and estimating tropical forest carbon stocks: making REDD a reality. *Environment research letters*, 2, 1-13.
- Global Forest Coalition. (2007). *Potential policy approaches and positive incentives to reduce emissions from deforestation in developing countries: a submission to the secretariat of the Framework Convention on Climate Change*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Global Forest Coalition. (2008). *Effective policies to reduce emissions from deforestation in developing countries (REDD) must address leakage and incorporate social impact criteria: a submission to the Secretariat of the UN Framework Convention on Climate Change*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Global Forest Coalition. (2012). *Submission by the Global Forest Coalition on methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Global Forest Coalition. (2013). *Submission by the Global Forest Coalition and Econexus in collaboration with the ICCA consortium on non-market-based approaches to reducing deforestation and forest degradation*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Global Witness. (2012). *Sustainable Forest Management in tropical forests: a major driver of deforestation and forest degradation: a submission by Global Witness*. Bonn, Germany: United Nations Framework Convention on Climate Change.

- Global Witness, & The Wilderness Society. (2008). *Positions ascribed to Global Witness and The Wilderness Society in FCCC/AWGLCA/2008/16/Rev.1: Corrections to para 61 relating to REDD*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Gray, R. (2010). Is accounting for sustainability actually accounting for sustainability ... and how would we know? An exploration of narratives of organisations and the planet. *Accounting, organizations and society*, 35(1), 47-62.
- Greenpeace. (2008). *Greenpeace submission on the UNFCCC Bali Action Plan concerning the REDD mechanism*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Greenpeace. (2018). Deforestation and climate change. Retrieved from <https://www.greenpeace.org.uk/what-we-do/forests/deforestation-climate-change/>
- Greer, S., & Patel, C. (2000). The issue of Australian indigenous world-views and accounting. *Accounting, auditing and accountability journal*, 13(3), 307-329.
- Groombridge, B., & Jenkins, M. (2002). *World atlas of biodiversity*. California: University of California Press.
- Hines, R. (1991). On valuing nature. *Accounting, auditing and accountability journal*, 4(3), 27-29.
- Hoque, Z., Parker, L., Covalleski, M., & Haynes, K. (2017). *The Routledge companion to qualitative accounting research methods*. Abingdon: Routledge.
- Hosonuma, N., Herold, M., Sy, V. D., Fries, R. D., Brockhaus, M., Verchot, L., Angelsen, A., & Romijn, E. (2012). An assessment of deforestation and forest degradation drivers in developing countries. *Environmental research letters*, 7, 1-12.
- Houghton, R. (2005). Tropical deforestation as a source of greenhouse gas emissions. In P. Moutinho & S. Schwartzman (Eds.), *Tropical deforestation and climate change* (pp. 13-22). Belem, Brazil: Amazon Institute for Environment Research.
- Houghton, R., Hobbie, J., Melillo, J., Moore, B., Peterson, B., Shaver, G., & Woodwell, G. (1983). Changes in the carbon content of terrestrial biota and soils between 1860 and 1980: a net release of CO₂ to the atmosphere. *Ecological monographs*, 53(3), 235-262.
- Hrasky, S., & Jones, M. (2016). Lake Pedder: accounting, environmental decision-making, nature and impression management. *Accounting forum*, 40(4), 285-299.
- IUCN. (2017). *Highlights 2016: Business and Biodiversity Programme*. Gland, Switzerland: International Union for the Conservation of Nature.
- Jones, M. (2010). Accounting for the environment: towards a theoretical perspective for environmental accounting and reporting. *Accounting forum*, 34(2), 123-138.
- Karsenty, A. (2008). The architecture of proposed REDD schemes after Bali: facing critical choices. *International Forestry Review*, 10(3), 443-457.
- Kornberger, M., Justesen, L., Madsen, A. K., & Mouritsen, J. (2015). *Making things valuable*. Oxford: Oxford University Press.
- Lehman, G. (1996). Environmental accounting: pollution permits or selling the environment. *Critical perspectives on accounting*, 7(6), 667-676.
- Lehman, G. (2017). The language of environmental and social accounting research: the expression of beauty and truth. *Critical perspectives on accounting*, 44, 30-41.
- Leverington, F., Costa, K. L., Pavese, H., Lisle, A., & Hockings, M. (2010). A global analysis of protected area management effectiveness. *Environmental management*, 46(5), 685-698.
- Lindsey, R. (2007). NASA Earth Observatory: tropical deforestation. Retrieved from <http://earthobservatory.nasa.gov/Features/Deforestation/>
- Lohmann, L. (2009). Toward a different debate in environmental accounting: the cases of carbon and cost benefit. *Accounting, organizations and society*, 34(3-4), 499-534.
- Lombardi, L. (2016). Disempowerment and empowerment of accounting: an Indigenous accounting context. *Accounting, auditing and accountability journal*, 29(8), 1320-1341.

- MacKenzie, D. (2009a). Making things the same: gases, emission rights and the politics of carbon markets. *Accounting, organizations and society*, 34(3-4), 440-455.
- MacKenzie, D. (2009b). *Material markets: how economic agents are constructed*. Oxford: OUP.
- Maunders, K. T., & Burritt, R. (1991). Accounting and ecological crisis. *Accounting, auditing and accountability journal*, 4(3), 9-26.
- McNicholas, P., & Windsor, C. (2011). Can the financialised atmosphere be effectively regulated and accounted for? *Accounting, auditing and accountability journal*, 24(8), 1071-1096.
- Milne, M. (1991). Accounting, environmental resource values, and non-market valuation techniques for environmental resources: a review. *Accounting, auditing and accountability journal*, 4(3), 81-109.
- Milne, M., & Gray, R. (2013). W(h)ither ecology? The triple bottom line, the Global Reporting Initiative, and corporate sustainability reporting. *Journal of business ethics*, 118, 13-29.
- Momin, M. A. (2013). Social and environmental NGOs' perceptions of corporate social disclosures: the case of Bangladesh. *Accounting forum*, 37(2), 150-161.
- Moore, B., Boone, R., Hobbie, J., Houghton, R., Melillo, J., Peterson, B., Shaver, G., Vorosmarty, C., & Woodwell, G. (1981). A simple model for the analysis of the role of terrestrial ecosystems in the global carbon budget. In B. Bolin (Ed.), *Modelling the global carbon cycle*. Oxford: Wiley.
- Morales-Hidalgo, D., Oswalt, S., & Somanathan, E. (2015). Status and trends in global primary forest, protected areas, and areas designated for conservation of biodiversity from the Global Forest Resources Assessment 2015. *Forest ecology and management*, 352, 68-77.
- Muniesa, F., Millo, Y., & Callon, M. (2007). An introduction to market devices. In M. Callon, Y. Millo, & F. Muniesa (Eds.), *Market devices* (pp. 1-12). Oxford: Blackwell Publishing.
- Natural Capital Coalition. (2016). *Natural Capital Protocol*. Milton Keynes: Natural Capital Coalition.
- Neeff, T., & Ascuri, F. (2009). Lessons from carbon markets for designing an effective REDD architecture. *Climate policy*, 9, 306-315.
- Neu, D. (2000). Accounting and accountability relations: colonization, genocide and Canada's first nations. *Accounting, auditing and accountability journal*, 13(3), 268-288.
- Rainforest Foundation, FERN, & Friends of the Earth International. (2008). *Submission to the UNFCCC Secretariat in response to requests for ideas and proposals on the elements contained in paragraph 1 of the Bali Action Plan*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- Rakatama, A., Pandit, R., Ma, C., & Iftekhhar, S. (2017). The costs and benefits of REDD+: a review of the literature. *Forest policy and economics*, 75, 103-111.
- Russell, S., Milne, M., & Dey, C. (2017). Accounts of nature and the nature of accounts: critical reflections on environmental accounting and propositions for ecologically informed accounting. *Accounting, auditing and accountability journal*, 30(7), 1426-1458.
- Silverman, A. (2014). *Know your rights related to REDD+: a guide for indigenous and local community leaders*. Washington, DC: Center for International Environmental Law.
- Skaerbaek, P., & Tryggstad, K. (2010). The role of accounting devices in performing corporate strategy. *Accounting, organizations and society*, 35(1), 108-124.
- Sullivan, S., & Hannis, M. (2017). 'Mathematics maybe, but not money': on balance sheets, numbers and nature in ecological accounting. *Accounting, auditing and accountability journal*, 30(7), 1459-1480.
- SustainUS. (2008). *SustainUS submission on behalf of the International Youth Delegation Forests and Land Use Working Group*. Bonn, Germany: United Nations Framework Convention on Climate Change.

- TEEB. (2010). *The economics of ecosystems and biodiversity: ecological and economic foundations*. London: Earthscan.
- Tregidga, H. (2013). Biodiversity offsetting: problematisation of an emerging governance regime. *Accounting, auditing and accountability journal*, 26(5), 806-832.
- UN. (2005a). *Global Forest Resources Assessment 2005*. Rome: United Nations Food and Agriculture Organization.
- UN. (2005b). *Reducing emissions from deforestation in developing countries: approaches to stimulate action: submission from the Governments of Papua New Guinea and Costa Rica*. Montreal, Canada: United Nations Framework Convention on Climate Change.
- UN. (2006). *Report on a workshop on reducing emissions from deforestation in developing countries*. Rome, Italy: United Nations Framework Convention on Climate Change.
- UN. (2007a). *Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007: Decisions adopted by the Conference of the Parties*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- UN. (2007b). *Resolution adopted by the General Assembly: non-legally binding instrument on all types of forests*. New York: United Nations General Assembly.
- UN. (2007c). *United Nations Declaration on the Rights of Indigenous Peoples*. New York: United Nations General Assembly.
- UN. (2010a). *Frequently asked questions and answers - the UN-REDD Programme and REDD+*. Geneva, Switzerland: UN-REDD Programme.
- UN. (2010b). *Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010: Decisions adopted by the Conference of the Parties*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- UN. (2014). *Key decisions relevant for reducing emissions from deforestation and forest degradation in developing countries (REDD+)*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- UN. (2015). *Adoption of the Paris Agreement, 12 December 2015*. Paris, France: United Nations Framework Convention on Climate Change.
- UN. (2018a). Financing solutions for sustainable development: Payments for ecosystem services. Retrieved from <http://www.undp.org/content/sdfinance/en/home/solutions/payments-for-ecosystem-services.html>
- UN. (2018b). United Nations: Climate Change. Retrieved from <http://unfccc.int/2860.php>
- UNU-IAS. (2009). *UNU-IAS Guide: Reducing emissions from deforestation and forest degradation in developing countries (REDD): A guide for indigenous peoples*. Yokohama: United Nations University - Institute for the Advanced Study of Sustainability.
- van Liempd, D., & Busch, J. (2013). Biodiversity reporting in Denmark. *Accounting, auditing and accountability journal*, 26(5), 833-872.
- Vollmer, H., Mennicken, A., & Preda, A. (2009). Tracking the numbers: across accounting and finance, organizations and markets. *Accounting, organizations and society*, 34(5), 619-637.
- Whiteman, G., & Cooper, W. (2000). Ecological embeddedness. *Academy of management journal*, 43(6), 1265-1282.
- Whiteman, G., & Cooper, W. (2011). Ecological sensemaking. *Academy of management journal*, 54(5), 889-911.
- Wilderness Society. (2008). *Submission of the Wilderness Society (Inc) to the update of the assembly document (FCCC/AWGLCA/2008/16)*. Bonn, Germany: United Nations Framework Convention on Climate Change.
- World Bank. (2016). *Natural Capital Accounting*. Washington, DC: World Bank.